A NEW IBERIAN SPECIES OF *PROTAPANTELES* (HYMENOPTERA: BRACONIDAE) ASSOCIATED WITH THE ENDEMIC MOTH *HELIOTHEA DISCOIDARIA* (LEPIDOPTERA: GEOMETRIDAE)[1]

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ABSTRACT: The genus *Protapanteles* (Hymenoptera: Braconidae) is recorded for the first time from the Iberian Peninsula. *Protapanteles santolinae*, a new Spanish species of the subfamily Microgastrinae, associated with the endemic moth *Heliothea discoidaria* which feeds on some endemic plants of the genus *Santolina* (Compositae), is described and illustrated. Moreover, it is compared with the allied species *Protapanteles triangulator* (Wesmael, 1837).

The Iberian Peninsula is one of the most peculiar areas of the Palearctic region. Its relative isolation from the rest of Europe, owing to the Pyrenees, as well as its proximity to Africa, makes it one of the most interesting centres of speciation in the Mediterranean area (Quézel 1978; López Martínez 1989). The result is a substantial number of endemic taxa, which quite often spread to zones as far away as the Maghreb. A recent study of the entomofauna associated with the genus *Santolina* (Compositae) has permitted us to discover a new species belonging to the genus *Protapanteles* (Braconidae: Microgastrinae), as well as to document a new and interesting parasitoid- host- plant relationship.

From a floral viewpoint, the Iberian Peninsula stands out as one of the most important zones in the Mediterranean region (with 7,500 species in Spain and 3,500 in Portugal), only slightly surpassed in diversity by the Turkish peninsula (Quézel 1985). The situation is repeated in a quite similar way in the Maghrebian area which also displays a high floral diversity, whose origin and evolution can only be explained from the Iberian microplate (Quézel 1983). Also, the Iberian entomological fauna, closely associated with the vegetable structures (Yela 1992), presents an identical diversity increase (Viedma & Gómez-Bustillo 1976; Balleto & Casale 1991; Baixeras 1992; Domínguez & Baixeras 1992). This endemic situation has also been detected in other arthropod and invertebrate groups (Sacchi 1962; Miracle 1982; Giusti & Manganelli 1984; Notenboom 1990; Ellis 1978; Margalef 1983), as well as in some families of vertebrates (Busack & Hedges 1984; Salvador

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1985; Hernando & Soriguer 1992). All this points to the Iberian Peninsula as one of the most significant areas of endemism in the Palearctic region.

The genus *Santolina* includes five species in the Iberian Peninsula (*S. oblongifolia, S. elegans, S. viscosa, S. rosmarinifolia* and *S. chamaecyparissus*). Only *S. chamaecyparissus* (Figure 1) has a vast distribution, colonizing most of the western Mediterranean (the central and southern part of the Iberian Peninsula, south of France, Italy, Corsica and Sardinia, as well as northern Africa). In contrast, the remaining species have distributions restricted to the Iberio-Maghrebian area (Guinea and Tutin 1976). It is usual to find these species in highly nitrophilic habitats, such as roadsides, fallow land, etc., as well as in large expanses of moorland and shrub steppe, accompanied by species of the genus *Artemisia* (basically *A. herba-alba* and *A. campestris*). It is also frequently observed along relict wood fringes with Spanish juniper (*Juniperus thurifera*), which occupy the most barren and xeromorfic zones in the centre of the peninsula and in the river Ebro depression (Monegros) (Braun-Blanquet & Bolós 1957).

The endemic character of these Compositae is of importance from the entomological point of view. A great number of endemic moths in the Iberian Peninsula, and the western Mediterranean area, feed on plants of this genus, as is the case for *Coleophora santolinella* Constant, *Coleophora involucrella* Chrétien, *Coleophora albicella* Constant (Coleophoridae), *Sophronia santolinae* Staudinger (Gelechiidae), *Stenodes peucedana* Ragonot, *Stenodes santolinana* Staudinger (Tortricidae), *Phyllophila numerica* Boisduval, *Cucullia santolinae* Rambur (Noctuidae), *Thetidia plusiaria* Boisduval, *Eupithecia santolinae* Mabille, *Athroolopha pennigeraria* Hübner or *Compsoptera jourdanaria* Serres (Geometridae). Likewise the presence of other groups of insects has been reported to have a close relationship with these plants, as illustrated by the family Aphididae with the aphids *Coloradoa moralesi* Remaudière & Leclaut and *Coloradoa bournieri* Remaudière & Leclaut, found only in the Iberian Peninsula and in the south of France (Remaudière & Leclaut 1969), as well as the cecidomyiid family with *Rhopalomyia santolinae* Tav., *Dictyomyia navasina* Tav., *D. setubalensis* Tav. and *Navasina santolinae* Tav., endemics in the Iberian Peninsula (Tavares 1900, 1902, 1919; Vilarrúbia 1936).

Protapanteles santolinae Oltra, NEW SPECIES

A new species belonging to the genus *Protapanteles* Ashmead, 1898 is described, according to the generic concept of *Protapanteles* adopted by Mason (1981). He split the old *Apanteles s. l.* into 23 genera, including *Protapanteles* (the members of Nixon's *triangulator* and *popularis*-group of *Apanteles* Foerster). The criteria adopted for the identification of the species studied are based on Nixon (1973, 1976), Papp (1984) and Wilkinson (1945).

Female. - Head (Figure 4): Covered with fine setae, transverse, a little narrower than mesosoma between the tegulae. Face shiny with superficial, confluent punctuation. Antenna shorter than body (3:4), flagellomeres 10-15 cubic (Figure 5), flagellomere 9 subcubic. Facial depression nearer apex of clypeus than eye. Hind imaginary tangent of anterior ocellus not touching posterior ocellus. Face very slightly transverse. Length of temple slightly greater than one fourth the length of eye. Temples convergent and slightly angular. Longitudinal diameter of eye somewhat greater than one half times transverse diameter.

Mesosoma (Figure 6): Mesoscutum covered with fine setae, shiny with faint satin-like sheen, throughout with confluent punctuation; scutellum shiny with minute, virtually obsolete, sparsely placed punctures, the non-excavated area of lateral faces of the scutellum reaching up beyond middle of scutellum very slightly; phragma of scutellum narrowly visible. Propodeum mostly smooth and shiny, towards posterior corners with more or less rugulosity; polished lunule of foramen with crenulate sculpture; two groups of setae latero-medially convergent towards medial line.

Legs: Hind coxa smooth, shiny; inner spur of hind tibia longer than outer and scarcely reaching middle of basitarsus.

Wings (Figure 8): Pterostigma 2.28 - 2.5 (2.5 in holotype) times as long as wide, metacarpus virtually same length as pterostigma, its distance from apex of SR1 somewhat less than a third of its own length; r arising from middle apically of pterostigma and forming obtuse angle with 2-SR, r and 2-SR subequal in length; discal cell (D1) very slightly longer than high (1.05 - 1.13), 1.06 in holotype; vannal lobe of hindwing straight and hairless.

Metasoma (Figures 7, 9 and 10): First tergite parallel-sided to where it turns over, thence rounded at its hind end, very slightly excavated in about the basal third, smooth and shiny except in about the very weakly to obsoletely rugose apical third or fourth with setae; median field more or less triangular-pentagonal shape because of its posterior corners losing definition and obscured in an area of vague rugosities with scattered setae, second tergite polished excepting the rugose zone; third tergite longer than second (4:3) and polished with medial or posterior scattered setae as the succeeding tergites; hypopygium very short, non truncate apex seen in profile; ovipositor sheaths short (Figure 9).

Color: Body black, labial palpi dark, maxillar palpi with dark basal and apical joints and infuscate yellow middle joints. Legs mainly dark; coxae, trocanters, basal three-fourths of middle and hind femora, apical three-fourths to half of hind tibiae black; the front and middle tibiae, the front, middle and hind tarsi mostly brown. Basal front and middle tibiae, basal front and middle basitarsi, half to third basal hind tibia, half hind basitarsus and apical extreme hind femur infuscate reddish yellow; spurs reddish yellow more or less infuscate. Tegula black. Wings hyaline; the C+Sc+R and 1R1 (pterostigma + metacarpus) veins brown; r, 2-SR and pigmented portion of 2-M veins light brown; pterostigma not uniformly opaque, downwards darker than basal and apical zones; majority of remaining veins colorless.

Male. Antenna about equal to the combined length of mesosoma and metasoma together with twice the length of the head; the preapical flagellomeres at least as long as 1.6 times its width; legs very dark, infuscate zones very reduced.

Length. - From 1.8 to 2mm. Holotype: 2mm.

Cocoon. - Length 2.5 mm, yellow, in groups because of its gregarious behavior. From 6 to 27 cocoons for each caterpillar.

Distribution. - Rincón de Ademuz (Valencia-Spain) and Villanueva de Alcorón (Guadalajara - Spain).

Material examined. - 31 type specimens (17 ♂♂ and 14 ♀♀) with different locality and collecting-time data.

Type material: Villanueva de Alcorón (Guadalajara), 4-VII-92, 1 ♀ holotype, 3 ♂♂ and 5 ♀♀ paratypes (leg. M. Domínguez); Rincón de Ademuz (Valencia), 20/21-VI-92, 14 ♂♂ and 8 ♀♀ paratypes (Leg. M. Domínguez).

Other material examined: Villanueva de Alcorón, 4-VII-92, 3 ♀♀ (leg. M. Domínguez); Rincón de Ademuz, 20/21-VI-92, 4 ♀♀ (leg. M. Domínguez); id., 25-VI-93, 1♀ (leg. M. Domínguez).

Holotype and paratypes are deposited in the Entomological Collection of the University of Valencia (Spain). Two paratypes (1 ♂ and 1 ♀) are deposited in the Hungarian Natural History Museum (Budapest).

Comments. - This species can be distinguished from *P. triangulator* (Wesmael, 1837), its most similar Palearctic relative, by its possession of the following combination of features:

P. santolinae	*P. triangulator* (Wesm.)
-♀: flagellomeres 10-15 cubic.	-♀: flagellomeres 10-15 distinctly longer than wide.
-Pterostigma less wide, 2.28-2.5 times as long as wide; D1 high, as long as high.	-Pterostigma wider, twice as long as wide; D1 less high, somewhat longer than high.
-Propendeum mostly smooth and shiny, towards posterior corners with more or less rugulosity.	-Propodeum usually medially or medially and latero-posteriorly uneven to rugulose, shiny.
-Inner spur of hind tibia obviously longer than outer.	-Hind tibial spurs equal or subequal.
-Median field of metasomal tergite 2 less wide, with rather triangular-pentagonal shape (Figure 10 B).	-Median field of metasomal tergite 2 wider, with rather triangular shape (Figure 10 A).
-Cocoon yellow.	-Cocoon white or very pale yellow.
-Host: *Heliothea discoidaria* Boisd. (Geometridae).	-Host: *Pseudoterpna pruinata* Hufn. (Geometridae), another macrolepidoptera and some microlepidoptera.

Pseudoterpna pruinata was the first host record for *P. triangulator*. In addition, other hosts have been mentioned in the literature: *Teichobia verhuellella* Stt. (Tineidae), *Bedellia somnulentella* Z., *Phyllonorycter strigulatella* Z. (Gracillariidae), *Coleophora ballotella* Fr., *Coleophora gryphipennella* Bché. (Coleophoridae), *Tortrix viridana* L. (Tortricidae), *Ellopia prosaparia* L., *Peribatodes rhomboidaria* Den. et Schiff. (Geometridae), *Amphipyra pyramidea* L. (Noctuidae), *Dasychira pudibunda* L. (Lymantriidae), *Stauropus fagi* L. (Notodontidae) and *Strymon w-album* Knoch (Lycaenidae) (Papp 1990).

Fig. 1

Fig. 2

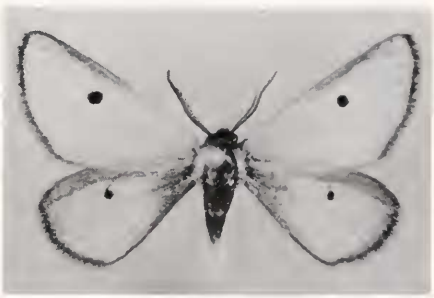

Fig. 3

Figure 1-3. 1, *Santolina chamaecyparissus* in a typical fallow land in Central Spain. 2, Last instar larvae of *Heliothea discoidaria*. 3, Adult of *H. discoidaria* moth.

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Figure 4-7. *Protapanteles santolinae*. 4, Head. 5, Apical flagellomeres of a female. 6, Mesosoma. 7, Metasoma showing the peculiar basal tergites.

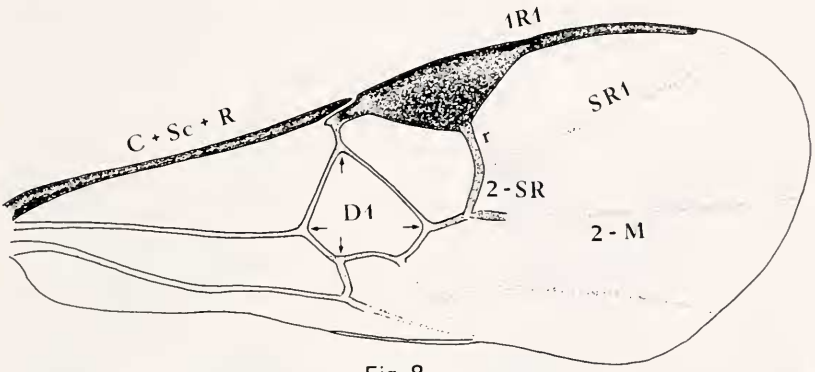

Fig. 8

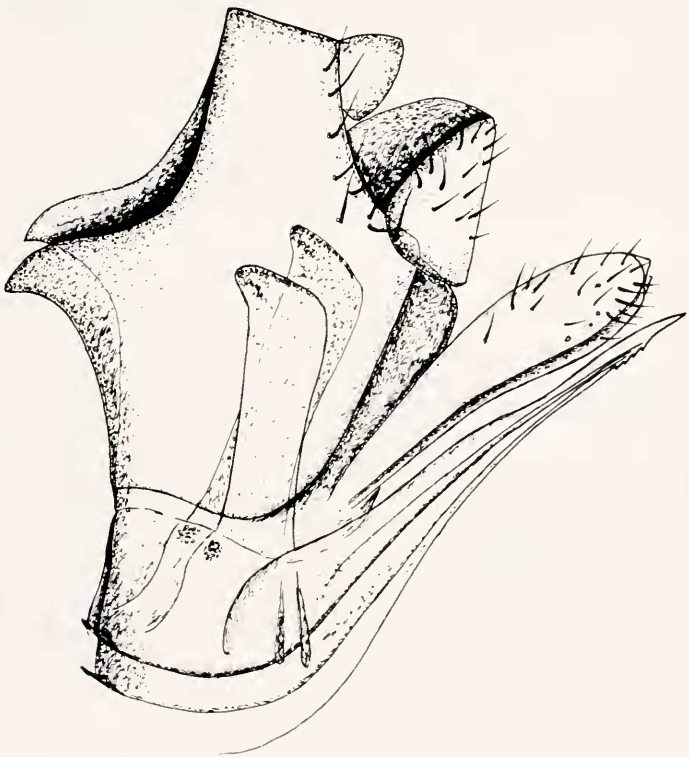

Fig. 9

Figure 8-9. *Protapanteles santolinae*. 8, Right forewing of a female (slide number 83). 9, Female genitalia (side number 85).

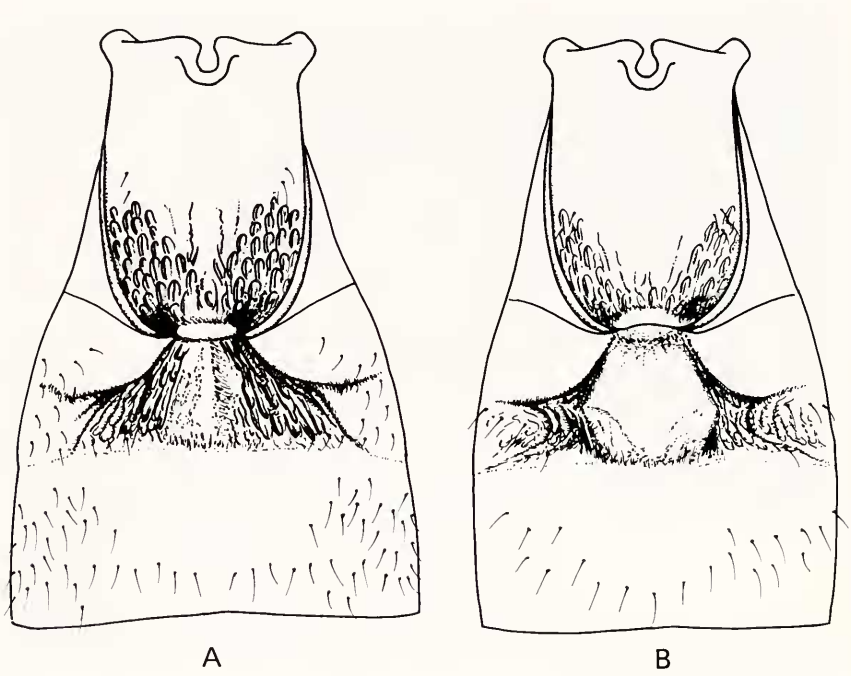

Figure 10. Basal tergites of *Protapanteles triangulator* (A) and *P. santolinae* (B).

DISCUSSION

Before starting our study of the entomofauna related to *Santolina,* the genus *Protapanteles* was unknown from the Iberian Peninsula. This is a small genus containing no more than thirty species; however, some species may be fairly common in the forested parts of the Holarctic Region (Mason 1981). This genus comprises 14 species in Europe, mainly parasitoids of Geometridae (Papp 1990). The present study is our first one of a planned series about this genus; surprisingly, we came to discover a new species, *Protapanteles santolinae*, a parasitoid found on the geometrid moth *Heliothea discoidaria* (Figure 2 and 3). In this way, a new parasitoid- host- plant relationship has been documented, closely associated with this group of Compositae. Up to the present, observations suggest the evolution of a peculiar and exclusive entomofauna on the species of the *Santolina* genus.

We consider it important to emphasize the endemic character of this lepidopteran, which is the only member of the Heliotheinae subfamily, and has only been found in the center of the Iberian Peninsula and in a few places in Morocco (Rungs 1982). The food plant of this species, *Santolina*

rosmarinifolia, was discovered in San Ildefonso (Segovia) and in the outskirts of Madrid (Chrétein 1905; Gómez de Aizpúrua 1987), and later it has also been captured feeding on *Santolina chamaecyparissus* in different places of the Iberian Peninsula.

With regard to the parasitoid, both *Protapanteles santolinae* n. sp. and *P. triangulator* have straight and hairless vannal lobes of the hind wing, an aberrant feature within *Protapanteles.* However, for the time being, we consider both species as included in this genus. If in the future new species with this peculiarity, accompanied by other significant characters, are discovered, then the possibility of describing a new genus should be considered.

When Mason (1981) established different tribes and genera from the genus *Apanteles* Förster *s. l.*, he stressed the importance of the structures of the jaw and papillae of the tegument in full-grown larvae. Therefore, we believe the study of the *Protapanteles* larvae can provide valuable data which, added to the observations made earlier on adults, will allow entomologists to consider the proposal for a new generic taxon.

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